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(54) A method for producing skimmed milk powder

(57) A method for producing skimmed milk powder from concentrated skimmed milk with a total solids content in the range of 34-42% TS comprises pasteurizing the concentrated skimmed milk at 34-42% TS in a direct steam injection pasteurizer and then raising the solids content of the pasteurized concentrated skimmed milk to in the range of 45-53% TS in a finisher. The concentrated skimmed milk is then pumped by a high pressure/homogenizer pump through a preheater into a main dryer from which the skimmed milk powder with a moisture content of approximately 6% by weight is produced. The temperature of the concentrated skimmed milk is raised up to 75°C in the preheater. A secondary dryer reduces the moisture content of the skimmed milk powder to approximately 3.5% by weight. The method is also suitable for producing fat filled skimmed milk powder.

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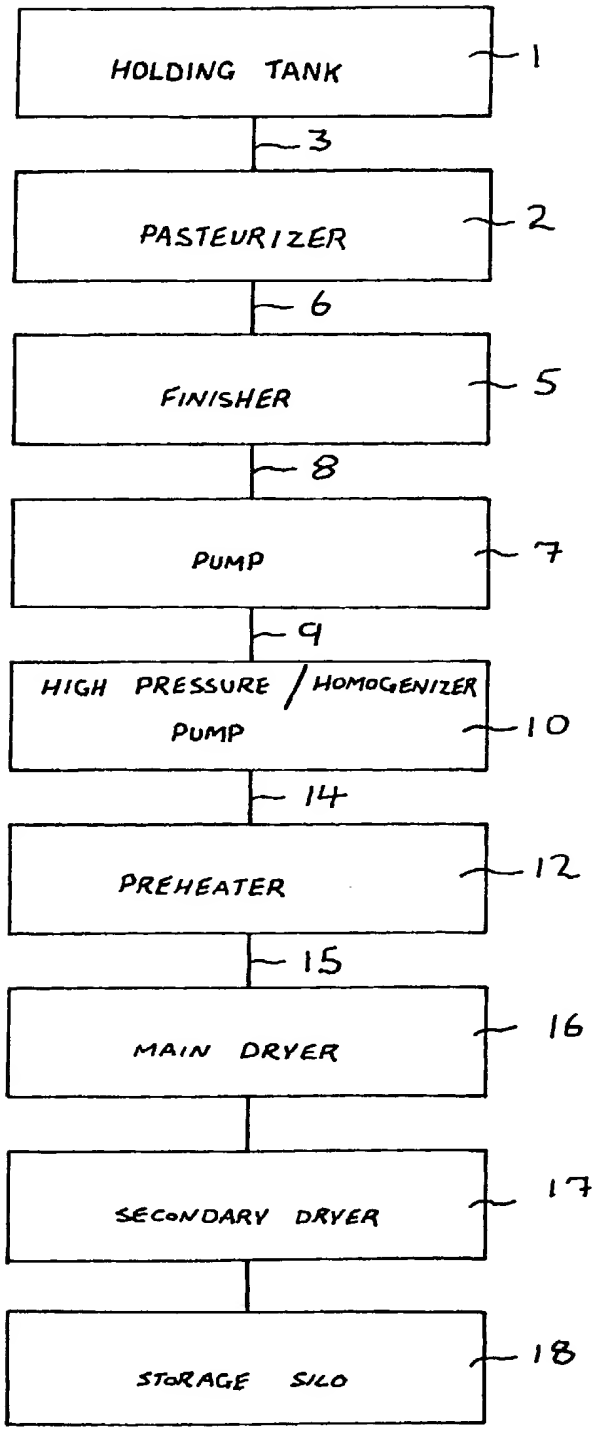
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PREHEATER
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MAIN DRYER
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SECONDARY DRYER
17
STORAGE SILO
18

FIG 1

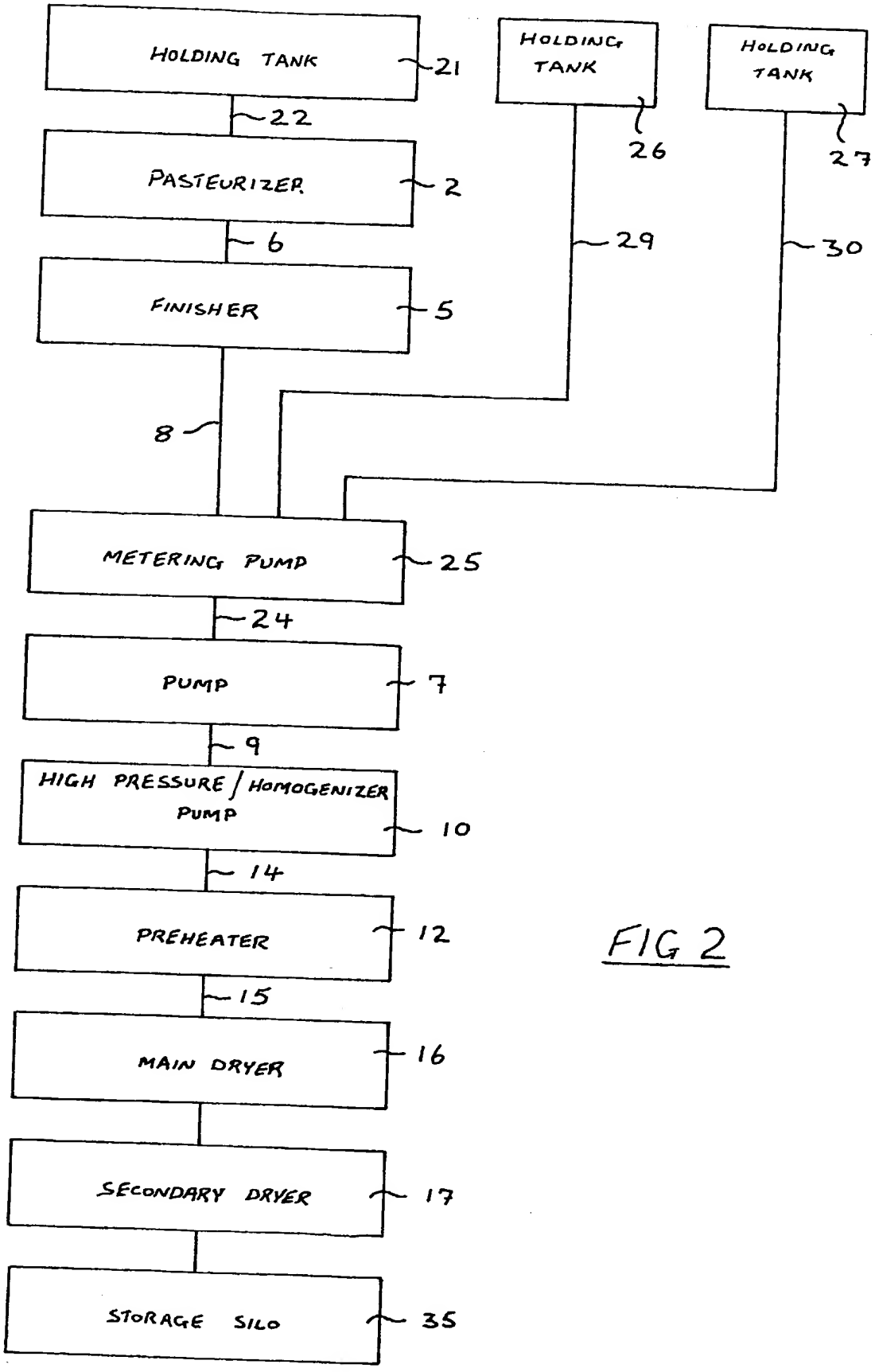
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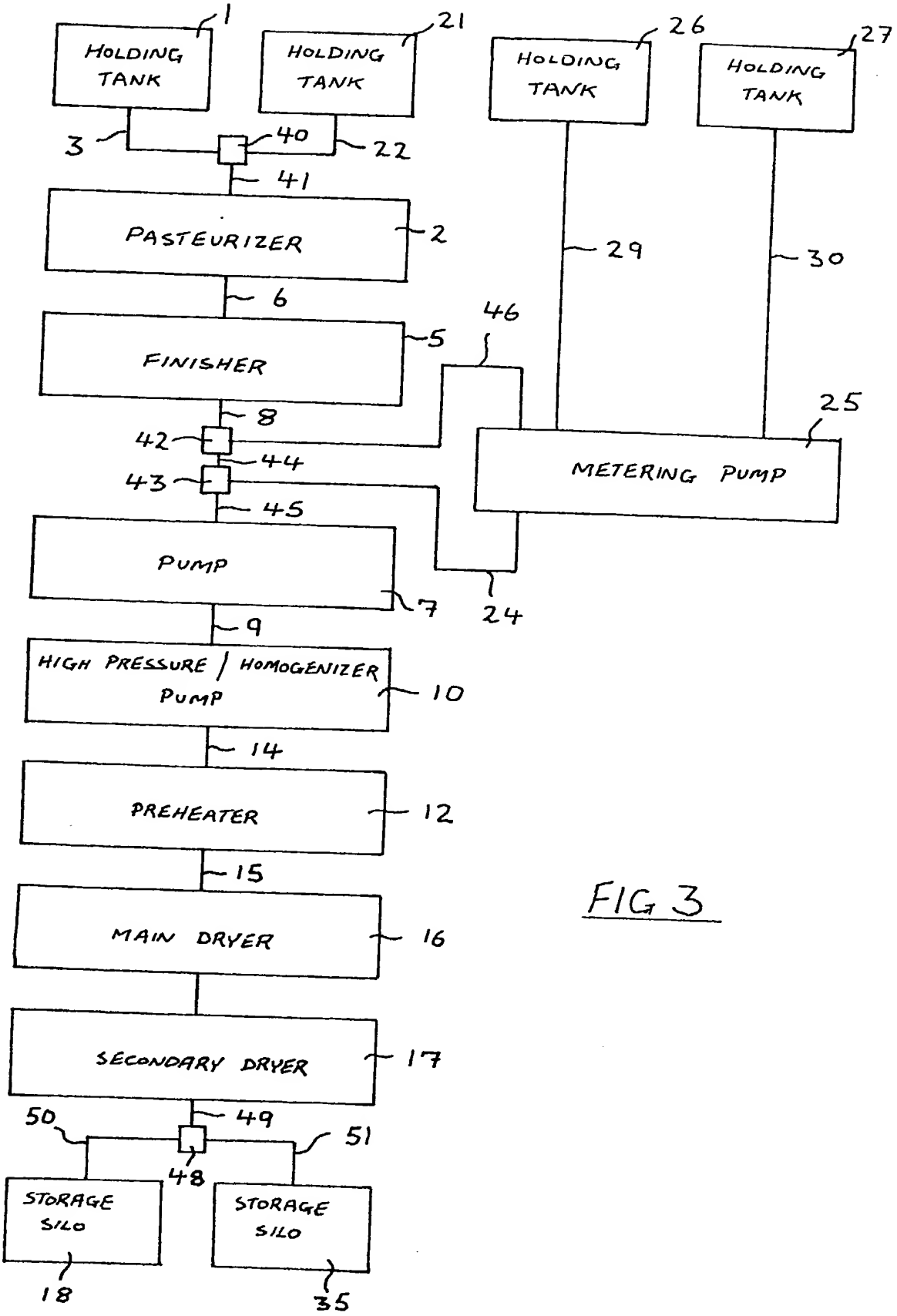
FIG 2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PUMP
7
24
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HIGH PRESSURE / HOMOGENIZER PUMP
10
14
PREHEATER
12
15
MAIN DRYER
16
SECONDARY DRYER
17
50
49
51
48
STORAGE SILO
STORAGE SILO
18
35

FIG 3

1

A METHOD FOR PRODUCING SKIMMED MILK POWDER

The present invention relates to a method for producing skimmed milk powder, and fat filled skimmed milk powder. The invention also relates to skimmed milk powder and fat filled skimmed milk powder produced according to the method.

Throughout this specification, the total solids content of concentrated skimmed milk is expressed as a percentage by weight of the concentrated skimmed milk. The total solids content is expressed as "% TS", meaning the percentage of total solids by weight in the concentrated skimmed milk.

Where it is desired to pump concentrated skimmed milk over relatively long distances, typically over 130 metres in a pipeline, it is important that the total solids content of the concentrated skimmed milk should not exceed 50% TS, and preferably, should not exceed 40% TS. Otherwise, the pumping energy required is relatively high, and furthermore, the concentrated skimmed milk is liable to become blocked in the pipeline. Where skimmed milk powder is pasteurized and concentrated, there are circumstances in which it is necessary to pump the pasteurized concentrated skimmed milk over relatively long distances for storage in a holding tank for processing at a later stage. In many cases, it is necessary to pasteurize the concentrated skimmed milk again prior to the later processing. In

general, plate pasteurizers or coil pasteurizers are used in the pasteurization process, and where the concentrated skimmed milk is of relatively high solids content, for example, over 35% TS, the pasteurization process becomes relatively inefficient. In many cases, a phenomenon known as burn-on occurs, which results in a layer of the skimmed milk being burnt on to the walls of the pasteurization apparatus. This causes considerable problems, both in a reduction in the efficiency of pasteurization apparatus and also in the requirement of regular maintenance and servicing of the apparatus for removing the burnt-on layer. In general, to overcome these problems, the solids content of the concentrated skimmed milk is reduced by dilution prior to pasteurization. However, this leads to a relatively inefficient process, in particular, where it is desired to produce skimmed milk powder, in that the energy requirement for producing the skimmed milk powder from the concentrated skimmed milk is unacceptably high.

There is therefore a need for a method for producing skimmed milk powder and/or fat filled skimmed milk powder from concentrated skimmed milk of a solids content greater than 34% TS which overcomes these problems.

The present invention is directed towards providing such a method for producing the skimmed milk powder

and/or fat filled skimmed milk powder. The invention is also directed towards the skimmed milk powder and the fat filled skimmed milk powder produced according to the method.

According to the invention, there is provided a method for producing skimmed milk powder from concentrated skimmed milk at a solids content in the range of 34% TS to 42% TS, the method comprising the steps of pasteurizing the concentrated skimmed milk at 34% TS to 42% TS in a direct steam injection pasteurizer, raising the solids content of the pasteurized concentrated skimmed milk to lie in the range of 45% TS to 53% TS in a finisher, and drying the concentrated skimmed milk at 45% TS to 53% TS in a main dryer to produce the skimmed milk powder.

In one embodiment of the invention, the concentrated skimmed milk at 45% TS to 53% TS is preheated prior to drying. Preferably, the concentrated skimmed milk at 45% TS to 53% TS is preheated to a temperature of up to 70°C prior to drying. Advantageously, the concentrated skimmed milk at 45% TS to 53% TS is preheated to a temperature of up to 75°C prior to drying.

In another embodiment of the invention, the concentrated skimmed milk at 34% TS to 42% TS is pasteurized at a temperature in the range of 85°C to

100°C. Preferably, the concentrated skimmed milk at 34% TS to 42% TS is pasteurized at a temperature of approximately 90°C.

In one embodiment of the invention, the solids content of the concentrated skimmed milk is reduced by 1% TS to 3% TS during pasteurization. Preferably, the solids content of the concentrated skimmed milk is reduced by 2% TS during pasteurization.

In one embodiment of the invention, the solids content of the concentrated skimmed milk is raised to lie in the range of 48% TS to 52% TS in the finisher, and preferably, is raised to lie in the range of 49% TS to 51% TS. Advantageously, the solids content of the concentrated skimmed milk is raised to approximately 50% TS in the finisher.

In another embodiment of the invention, the concentrated skimmed milk prior to pasteurization has a solids content in the range of 38% TS to 42% TS, and preferably, in the range of 39% TS to 41% TS, and advantageously, the solids content of the concentrated skimmed milk prior to pasteurization is approximately 40% TS.

In another embodiment of the invention, the solids content of the concentrated skimmed milk is raised to

lie in the range of 45% TS to 47% TS in the finisher, and preferably, is raised in the finisher to 46% TS.

In a still further embodiment of the invention, the concentrated skimmed milk prior to pasteurization has a solids content in the range of 34% TS to 38% TS, and preferably, in the range of 35% TS to 37% TS. Advantageously, the concentrated skimmed milk prior to pasteurization has a solids content of approximately 36% TS. With such a solids content, the concentrated skimmed milk is particularly suitable for use in the production of fat filled skimmed milk powder.

In a further embodiment of the invention, the skimmed milk powder is produced from the main dryer with a moisture content of approximately 6% by weight. Advantageously, the moisture content of the dried skimmed milk powder produced from the main dryer is further reduced to approximately 3.5% by weight in a secondary dryer.

In a further embodiment of the invention, where the method is used for the production of fat filled skimmed milk powder, the method comprises the further step of adding a fat to the concentrated skimmed milk after the concentrated skimmed milk has been delivered from the finisher. In one embodiment of the invention, the fat is a vegetable fat, and alternatively, the fat is an

animal fat, for example, cream. In certain cases, the fat may be a mixture of animal and vegetable fat. Preferably, the fat is in liquid form. Preferably, the fat is added to the concentrated skimmed milk in a proportion in the range of 10% to 20% by volume of the concentrated skimmed milk. Advantageously, the fat is added to the concentrated skimmed milk in the proportion of approximately 12.5% by volume of the concentrated skimmed milk.

In a further embodiment of the invention, the concentrated skimmed milk is stored in a holding tank prior to pasteurization, and the concentrated skimmed milk is pumped to the holding tank, and in certain cases, the concentrated skimmed milk is pumped over a distance of at least 100 metres.

Additionally, the invention provides skimmed milk powder produced according to the method of the invention.

Further, the invention provides fat filled skimmed milk powder produced according to the method of the invention.

The invention will be more clearly understood from the following description of some preferred embodiments thereof, given by way of example only, with reference

to the accompanying drawings, in which:

Fig. 1 is a block diagram of process apparatus for carrying out a method for producing skimmed milk powder according to the invention,

Fig. 2 is a block diagram of process apparatus for carrying out a method for producing fat filled skimmed milk powder according to another embodiment of the invention, and

Fig. 3 is a block diagram of process apparatus for carrying out a method for producing skimmed milk powder and fat filled skimmed milk powder, also according to the invention.

Referring initially to Fig. 1, there is illustrated a block diagram of process apparatus for carrying out a method according to the invention for producing skimmed milk powder from concentrated skimmed milk. In this embodiment of the invention, the concentrated skimmed milk from which the skimmed milk powder is produced has a total solids content of approximately 40% TS. The concentrated skimmed milk is stored in a holding tank illustrated in block representation in Fig. 1 and indicated by the reference numeral 1. In practice, the concentrated skimmed milk in the holding tank 1 would have been pumped from an earlier pasteurization and

concentration process which may have been carried out at a remote location and would normally require pumping of the concentrated skimmed milk through a pipeline over at least 100 metres. In this case, the concentrated skimmed milk is pumped through a pipeline over a distance of approximately 130 metres. The concentrated skimmed milk at 40% TS may be held in the holding tank 1 for a number of hours, and in certain cases, a number of days. Accordingly, it is necessary that the concentrated skimmed milk should again be pasteurized. Indeed, in many cases, unpasteurized concentrated skimmed milk at 40% TS may be mixed with the concentrated skimmed milk at 40% TS in the tank 1.

In the method according to the invention, the concentrated skimmed milk at 40% TS in the tank 1 is first pasteurized in a direct steam injection pasteurizer, indicated by the reference numeral 2. The concentrated skimmed milk at 40% TS is delivered from the holding tank 1 to the pasteurizer 2 through a pipeline 3. Pasteurization is carried out at a temperature of approximately 90°C and the pasteurized concentrated skimmed milk leaves the pasteurizer 2 at approximately 38% TS. The pasteurized concentrated skimmed milk is delivered to a finisher 5 through a pipeline 6, and the solids content of the concentrated skimmed milk is raised in the finisher 5 to approximately 50% TS. In this embodiment of the

invention, the finisher 5 is a vacuum evaporation vessel.

A pump 7 pumps the concentrated skimmed milk at 50% TS from the finisher 5 through pipelines 8 and 9 to a high pressure/homogenizer pump 10. The pump 7 is a centrifugal pump and maintains a positive pressure in the pipeline 9 relative to the pipeline 8 to prevent backflow from the high pressure/homogenizer pump 10. The high pressure/homogenizer pump 10 pumps the concentrated skimmed milk through a preheater 12 and in turn to a main dryer 16 where the concentrated skimmed milk is dried to produce the skimmed milk powder. The high pressure/homogenizer pump 10 pressurizes the concentrated skimmed milk at 50% TS to a pressure of typically 180 bar which is sufficient for atomising the concentrated skimmed milk in the main dryer 16. The main dryer 16 is a tall form spray dryer and produces the skimmed milk powder with a moisture content of approximately 6% by weight. A pipeline 14 connects the high pressure/homogenizer pump 10 to the preheater 12 and a pipeline 15 connects the preheater 12 to the main dryer 16. The preheater 12 is a tubular heater and the concentrated skimmed milk at 50% TS is heated in the preheater 12 to a temperature of approximately 70°C prior to being delivered through the pipeline 15 into the main dryer 16.

The skimmed milk powder from the main dryer 16 is delivered to a secondary dryer 17 provided by a fluidized bed dryer which further reduces the moisture content of the skimmed milk powder to approximately 3.5% by weight. The skimmed milk powder at a moisture content of 3.5% is delivered to and stored in a powder storage silo 18. The skimmed milk powder may be sold in bulk form, bagged or the like from the storage silo 18.

It has been found that by rising the solids content of the concentrated skimmed milk to 50% TS in the finisher 5 after pasteurization and prior to being delivered into the main dryer 16, the energy requirement of the main dryer 16 is considerably reduced. Furthermore, it has been found that by preheating the concentrated skimmed milk to a temperature of 70°C prior to being delivered into the main dryer 16, further reduces the energy requirement of the main dryer 16. It has been found that the overall reduction in the energy requirement of the main dryer 16 as a result of rising the solids content of the concentrated skimmed milk to 50% TS and by preheating the concentrated skimmed milk prior to drying is considerably greater than the energy consumption of the finisher 5 and the preheater 12. In practice, it has been found that the saving in energy consumption in the production of skimmed milk powder using the method according to the invention is

approximately 1.1 tonne of steam at a temperature of approximately 204°C and at a pressure of approximately 16 bar per tonne of skimmed milk powder produced. It has also been found that, providing the temperature of the concentrated skimmed milk is not raised above 75°C during preheating, the preheating process is relatively efficient, and the danger of burn-on occurring in the preheater 12 is substantially eliminated. Accordingly, maintenance and servicing of the process apparatus is significantly reduced. Furthermore, by virtue of the fact that the preheater 12 is disposed between the high pressure/homogenizer pump 10 and the main dryer 16, considerably reduces down time and maintenance of the high pressure/homogenizer pump. This is as a result of the fact that the temperature of the concentrated skimmed milk passing through the high pressure/homogenizer pump 10 is considerably reduced than in processes known heretofore.

Referring now to Fig. 2, there is illustrated process apparatus for carrying out a method also according to the invention for producing fat filled skimmed milk powder. The method for producing the fat filled skimmed milk powder is partly similar to the method for producing the skimmed milk powder, and somewhat similar process apparatus is used. Where the two methods and the process apparatus are substantially similar, similar components of the apparatus are identified by

the same reference numerals. In this embodiment of the invention, the concentrated skimmed milk is stored in a holding tank 21 which is similar to the holding tank 1. The concentrated skimmed milk stored in the holding tank 21 in this case has a solids content of approximately 36% TS. The concentrated skimmed milk is delivered from the holding tank 21 through a pipeline 22 into the direct steam injection pasteurizer 2 and is pasteurized at 90°C. The solids content of the concentrated skimmed milk is reduced to 34% TS in the pasteurizer 2. The concentrated skimmed milk is then delivered through the pipeline 6 into the finisher 5, where the solids content of the concentrated skimmed milk is raised to approximately 46% TS.

The concentrated skimmed milk is delivered from the finisher 5 through a pipeline 8 to a metering pump 25, where fat and other additives are added to the concentrated skimmed milk. In this embodiment of the invention, the fat is a vegetable fat and is mixed in the ratio of 12.5% by volume of the concentrated skimmed milk. Other additives, for example, are sugar and vitamins, which are mixed with the concentrated skimmed milk in the proportion of 0.6% and 0.01%, respectively, by volume of the concentrated skimmed milk. A holding tank 26 stores the vegetable fat. The sugar and vitamins are premixed and stored in a holding tank 27. Pipelines 29 and 30 deliver the fat, and

sugar and vitamins from the tanks 26 and 27, respectively, to the metering pump 25. The metering pump 25 delivers the concentrated skimmed milk, vegetable fat and additives into the pipeline 24. The pump 7 pumps the mixture through the pipeline 9 into the high pressure/homogenizer pump 10. The concentrated skimmed milk, the fat and the sugar and vitamins are mixed and homogenized in the high pressure/homogenizer pump 10. The homogenized mixture is pumped by the homogenizer pump 10 through the pipeline 14, the preheater 12, the pipeline 15 and into the main dryer 16. The temperature of the homogenized mixture is raised in the preheater 12 to 70°C prior to being delivered into the main dryer 16. Fat filled skimmed milk powder is produced and delivered from the main dryer 16 with a moisture content of approximately 6% by weight. The fat filled skimmed milk powder is then delivered into the secondary dryer 17 where the moisture content is further reduced to approximately 3.5% by weight. The fat filled skimmed milk powder is then delivered into a fat filled skimmed milk powder storage silo 35. Free flowing agents and the like may be mixed with the fat filled skimmed milk powder after drying in the dryer 17.

It has been found that using the method and process apparatus illustrated in Fig. 2 for producing fat filled skimmed milk powder provides significant energy

savings which is substantially similar to the energy savings achieved in the method of Fig. 1 for the production of skimmed milk powder. It has been found that the overall energy saving in using the method of Fig. 2 for producing fat filled skimmed milk powder is in the order of 1.1 tonnes of steam at a temperature of approximately 204°C and at a pressure of approximately 16 bar per tonne of fat filled skimmed milk powder produced.

Referring now to Fig. 3, there is illustrated process apparatus suitable for producing skimmed milk powder and fat filled skimmed milk powder using the method according to the invention. The process apparatus of Fig. 3 essentially combines the components of the process apparatus of Figs. 1 and 2 and similar components are identified by the same reference numerals. Holding tanks 1 and 21 for the concentrated skimmed milk for producing the skimmed milk powder and the fat filled skimmed milk powder, respectively, are connected to the steam injection pasteurizer 2 through a valve 40. The holding tank 1 holds the concentrated skimmed milk at approximately 40% TS, while the holding tank 21 holds concentrated skimmed milk at approximately 36% TS. The valve 40 is connected to the pasteurizer 2 by a pipeline 41 and selectively connects the holding tank 1 and the holding tank 21 through their respective pipelines 3 and 22 through the

pipeline 41 into the pasteurizer 2. Valves 42 and 43 between the finisher 5 and the pump 7 selectively connect the finisher 5 directly to the pump 7 for the production of skimmed milk powder or through the metering pump 25 for the production of fat filled skimmed milk powder. The valve 42 is connected through the pipeline 8 to the finisher 5 and to the valve 43 through a pipeline 44. A pipeline 45 connects the valve 43 to the pump 7. A pipeline 46 connects the valve 42 to the metering pump 25, while the pipeline 24 from the metering pump 25 connects the metering pump 25 to the valve 43. The valve 42 selectively connects the pipeline 8 with the pipeline 46 or 44, while the valve 43 selectively connects the pipeline 45 with the pipeline 44 or 24. Accordingly, in the production of skimmed milk powder, the valves 42 and 43 directly connect the finisher 5 to the pump 7 through the pipelines 8, 44 and 45. In the production of fat filled skimmed milk powder, the valves 42 and 43 connect the finisher 5 to the pump 7 through the metering pump 25 and through the pipelines 8, 46, 24 and 45. A duct 49 from the secondary dryer 17 delivers the skimmed milk powder and the fat filled skimmed milk powder to a diverting valve 48, which selectively connects the duct 49 with a duct 50 or 51 for delivering the skimmed milk powder to the storage silo 18 and the fat filled skimmed milk powder to the storage silo 35. Other valves (not shown) are provided

in the process apparatus of Fig. 3 where required. The provision of such valves will be well known to those skilled in the art. Where it is desired to use the process apparatus for the production of skimmed milk powder, the valves are set accordingly. Where the process apparatus is to be used to produce fat filled skimmed milk powder, the valve positions are altered accordingly.

While the skimmed milk powder has been produced from concentrated skimmed milk at 40% TS, it is envisaged that the solids content of the concentrated skimmed milk may be in the range of 34% TS to 42% TS, but preferably, would be in the range of 39% TS to 41% TS prior to being delivered to the direct steam injection pasteurizer. Further, it is envisaged that where the solids content of the concentrated skimmed milk is less than or greater than 40% TS prior to pasteurization, the solids content of the concentrated skimmed milk will be lesser or greater, respectively, than 50% TS on leaving the finisher. It is envisaged that the variation in the solids content of the concentrated skimmed milk leaving the finisher may be in the range of 45% TS to 53% TS, but would preferably be in the range of 49% TS to 51% TS.

Further, it is envisaged that while the solids content of the concentrated skimmed milk being delivered to the

direct steam injection pasteurizer in the method for the production of fat filled skimmed milk powder has been described as being approximately 36% TS, the solids content of the concentrated skimmed milk may lie in the range of 34% TS to 38% TS, but preferably would be in the range of 35% TS to 37% TS. Similarly, the solids content of the concentrated skimmed milk leaving the finisher may lie in the range of 45% TS to 53% TS, but would preferably be in the range of 45% TS to 47% TS.

It will of course be appreciated that while the temperature of pasteurization in both processes has been described as being 90°C, pasteurization may be carried out at any other suitable temperature, but should preferably lie in the range of 85°C to 100°C. Similarly, it will be appreciated that the temperature of the concentrated skimmed milk may be raised to other suitable temperatures besides 70°C in the preheater in both processes. However, it is believed that it is preferable that the temperature should not exceed 75°C.

Needless to say, while the method has been described as producing skimmed milk powder and fat filled skimmed milk powder from the main dryer with a moisture content of 6% by weight, the moisture content may vary around this value. Furthermore, where in certain cases a lower moisture content is required, other suitable

additional drying steps may be used besides further drying the skimmed milk powder or fat filled skimmed milk powder in a fluidized bed dryer. Indeed, the type of secondary dryer used will largely depend on the final moisture content desired.

While the fat added to the concentrated skimmed milk in the example for the production of fat filled skimmed milk powder has been described as a vegetable fat, if desired, an animal fat may be used, and indeed, it will be appreciated that the fat may be a mixture of animal and vegetable fat. Needless to say, while the proportion of vegetable fat added to the concentrated skimmed milk powder has been described as being 12.5% by volume of the concentrated skimmed milk, the quantity of fat added may vary, however, in general, it is envisaged that the quantity of fat added to the concentrated skimmed milk will be in the range of 10% to 20% by volume of the concentrated skimmed milk.

CLAIMS

1. A method for producing skimmed milk powder from concentrated skimmed milk at a solids content in the range of 34% TS to 42% TS, the method comprising the steps of

pasteurizing the concentrated skimmed milk at 34% TS to 42% TS in a direct steam injection pasteurizer,

raising the solids content of the pasteurized concentrated skimmed milk to lie in the range of 45% TS to 53% TS in a finisher, and

drying the concentrated skimmed milk at 45% TS to 53% TS in a main dryer to produce the skimmed milk powder.

2. A method as claimed in Claim 1 in which the concentrated skimmed milk at 45% TS to 53% TS is preheated prior to drying.

3. A method as claimed in Claim 2 in which the concentrated skimmed milk at 45% TS to 53% TS is preheated to a temperature of up to 70°C prior to drying.

4. A method as claimed in Claim 3 in which the concentrated skimmed milk at 45% TS to 53% TS is preheated to a temperature of up to 75°C prior to drying.

5. A method as claimed in any preceding claim in which the concentrated skimmed milk at 34% TS to 42% TS is pasteurized at a temperature in the range of 85°C to 100°C.

6. A method as claimed in Claim 5 in which the concentrated skimmed milk at 34% TS to 42% TS is pasteurized at a temperature of approximately 90°C.

7. A method as claimed in any preceding claim in which the solids content of the concentrated skimmed milk is reduced by 1% TS to 3% TS during pasteurization.

8. A method as claimed in Claim 7 in which the solids content of the concentrated skimmed milk is reduced by 2% TS during pasteurization.

9. A method as claimed in any preceding claim in which the solids content of the concentrated skimmed milk is raised to lie in the range of 49% TS to 51% TS in the finisher.

10. A method as claimed in Claim 9 in which the solids content of the concentrated skimmed milk is raised to approximately 50% TS in the finisher.

11. A method as claimed in any preceding claim in

which the concentrated skimmed milk prior to pasteurization has a solids content in the range of 39% TS to 41% TS.

12. A method as claimed in Claim 11 in which the concentrated skimmed milk prior to pasteurization has a solids content of approximately 40% TS.

13. A method as claimed in any of Claims 1 to 8 in which the solids content of the concentrated skimmed milk is raised to lie in the range of 45% TS to 47% TS in the finisher.

14. A method as claimed in Claim 13 in which the solids content of the concentrated skimmed milk is raised to approximately 46% TS in the finisher.

15. A method as claimed in Claim 13 or 14 in which the concentrated skimmed milk prior to pasteurization has a solids content in the range of 35% TS to 37% TS.

16. A method as claimed in Claim 15 in which the concentrated skimmed milk prior to pasteurization has a solids content of approximately 36% TS.

17. A method as claimed in any preceding claim in which the skimmed milk powder is produced from the main dryer with a moisture content of approximately 6% by

weight.

18. A method as claimed in any preceding claim in which the moisture content of the dried skimmed milk powder produced from the main dryer is further reduced to approximately 3.5% by weight in a secondary dryer.

19. A method as claimed in any preceding claim in which the method is for producing a fat filled skimmed milk powder, the method comprising the further step of adding a fat to the concentrated skimmed milk after the concentrated skimmed milk has been delivered from the finisher.

20. A method as claimed in Claim 19 in which the fat is a vegetable fat.

21. A method as claimed in Claim 19 in which the fat is an animal fat.

22. A method as claimed in any of Claims 19 to 21 in which the fat is in liquid form.

23. A method as claimed in any of Claims 19 to 22 in which the fat is added to the concentrated skimmed milk in a proportion in the range of 10% to 20% by volume of the concentrated skimmed milk.

24. A method as claimed in any preceding claim in which the concentrated skimmed milk is stored in a holding tank prior to the pasteurization.

25. A method as claimed in Claim 24 in which the concentrated skimmed milk is pumped to the holding tank.

26. A method as claimed in Claim 24 or 25 in which the concentrated skimmed milk is pumped over a distance of at least 100 metres.

27. A method for producing skimmed milk powder substantially as described herein with reference to and as illustrated in the accompanying drawings.

28. A method for producing a fat filled skimmed milk powder substantially as described herein with reference to and as illustrated in the accompanying drawings.

29. Skimmed milk powder produced according to the method of any of Claims 1 to 27.

30. Fat filled skimmed milk powder produced according to the method of any of Claims 1 to 26 and 28.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

9112417.2

Relevant Technical fields

(i) UK Cl (Edition K) A2B: BMD2;BMD23. A2D:DED

(ii) Int Cl (Edition 5) A23C 9/00;9/18;9/20 A23J 1/20

Search Examiner

B S Stringer

Databases (see over)

(i) UK Patent Office

(ii) None

Date of Search

26.9.91

Documents considered relevant following a search in respect of claims 1-30

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	None	

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Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

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